metaphysics, it was now the case with psychology. He spoke of the importance of this process as far as the increase of knowledge is concerned, and also as regards the improvement of each of the sciences and their relations one to another. He then traced the experimental and speculative character of psychology. Experimental psychology, the president urged, should confine itself solely to the scientific observation of facts. Certain facts, called psychical (Wallace, Crookes, Zöllner, Thury, &c.), are incapable of any explanation, at least by known physical forces, and it is the duty of science to examine these if psychology is really to assume an experimental character. The facts referred to belong, it may be, to psychophysics. When psychology has really become an experimental science such phenomena will be known not only by their external manifestations, but also by their hidden source, and the knowledge of them will become an organic whole.

Mr. E. Fischer (Bern) read a paper on the biological species of parasitic fungi and of the origin of new forms in the vegetable kingdom. The nature and properties of biological species were studied particularly in the Uredinées, and more recently in *Claviceps purpurea*. Philogenetically, at present, a common origin is attributed to the biological forms of a *species*; consequently, it seems plausible that the original form (Stammform) inhabits all the hosts on which its descendants now live, and that some at least among its descendants may be specialised on one or other of the nourishing plants. Reciprocally, the passage of one parasite to new hosts has been observed directly. Among the causes of the origin of biological species, following Klebalen, is admitted in the first line the direct adaptation (Anpassung und Angewöhnung) of these nourishing plants. It was also said that the explanation given is not applicable at present to the origin of species morphologically different; the morphological characters of species are, at most, partially attributable to the direct action of the nourishing plants (Näherpflanzen), and for the most part they must be related to the characters of the organisation in the sense used by Nägeli.

M. H. Dufour (Lausanne) took for the subject of his paper to the conference ten years' observations of solar radiation in Switzerland, and its diminution in 1903. The Swiss plateau on the north of the Alps (Lausanne, Bern, Zürich, Bâle) has a number of hours of sunshine varying between 1900 at Lausanne and 1200 at Bâle, that is to say, 47–44 per cent. of the greatest insolation possible. The maximum occurs in August (64–57 per cent.), the minimum in December or January (27–29 per cent.); in March and May the insolation is relatively feeble. To the south of the Alps (Lugano, Locarno) 2300 hours of sunshine were recorded, 59 per cent. of the possible maximum; two minima occur in May and November, and two maxima in July and February, with 60 per cent. At Alpine observatories the character of the results changes. At Davos (1500 m.) the insolation is not so strong in winter as in summer, when 1800 hours of sunshine are recorded; two minima are observed—in January and May—and two maxima (February and September–October). At the summit of Säntis (2500 m.) the insolation of winter, 45 per cent., exceeds markedly that of summer, 40 per cent. The mean amount is 42 per cent; the minimum occurs in May and June, and the maximum in November. For the intensity of the solar radiation, measured by Bührer (Clarens-Montreux) and Dufour (Lausanne), the result has been obtained of 8·5 calories (kilogram-degrees) per minute and per square metre of normal black surface on the sun between 11 and 1 o'clock. The maximum occurs in April–May, the minimum in January. At an altitude of 400–500 m. it rarely exceeds 10 calories, at 2000 m. (Rochers de Naye) 13 calories. In 1903 the values of the actinometric measures are notably feebler than in previous years, probably because of an abnormal opacity of the atmosphere, which may be attributed to the diffusion in the air of dust arising from the violent volcanic eruptions of the Lesser Antilles, which would facilitate the condensation of aqueous vapour in the form of fog—very attenuated and invisible, but yet absorbent.

M. P. Weiss (Zürich) exhibited by means of a series of interesting experiments the new magnetic properties of pyrrhotine, that is to say, the directions in which crystals of this mineral are sensitive to the influence of magnets.

M. A. Lang (Zürich), in speaking of the biological significance of elegance in certain marine organisms, said that the scientific study of animal forms did not prevent an understanding of the æsthetic manifestations of nature which could be applied in decorative art, for instance. He showed that all those characters which give beauty and charm to the marine fauna—such as form and symmetry, phosphorescence, and transparency—enable these animal forms to respond to their environment, and thus to facilitate and assure their continued existence.

The number and importance of the communications which dealt with the canton of Ticino were very remarkable. M. C. Keller (Zürich), with his descent of the animal world of the Ticino cantons showed that the fauna principally studied by Stabile and Pavesi contains very different elements; the lacustrine is a *fauna relicta* (Pavesi), and the terrestrial contains arctico-alpine elements. But the most remarkable characteristics are those of the sylvatic fauna of central Europe, and also the great number of types of the Mediterranean subregion. He also made several interesting comparisons with the fauna of other Swiss regions, and showed several new researches for Ticino which have been found by him. At the same meeting M. F. Merz (Bellinzona) spoke on the forestry of the Ticino canton, and similar questions were referred to in various sections by MM. Freuler, Bettelini, Calloni, and Pometta.

The most largely attended sectional meetings were those concerned with physics and chemistry, and the most important papers read at these meetings were those of MM. Haller (Paris), Schär (Strassburg), de la Rive (Geneva), Nölting (Mülhouse), Forel (Morges), Bertoni (Livorno), Tomasina, Soret (Geneva), Schühmacher-Kopp (Lucerne), Riggenbach (Bâle), Hagenbach (Bonn), and others.

In the botanical section the most interesting communications were those of MM. Rikli (Zürich), C. Schröter (Zürich), A. Usteri, and Wilezeck (Lausanne); in the zoological section a magnificent monograph was presented by the honorary member, M. P. Pavesi (Pavia), on the fauna of the valley of Aosta, and papers were read by MM. Lang, Keller, Studer (Bern), Volz (Bern), and Pictet (Geneva); the section of geology and mineralogy mustered but a very small attendance, for the Swiss geologists were almost all at the international congress at Vienna.[1]

The excursions and the receptions, which took place in exceptionally fine weather, the cordial welcome and generous hospitality of the residents, all contributed to the splendid success of this year's gathering. R. NATOLI.

THE NATURE-STUDY EXHIBITION.

THROUGH the kindness of the Civil Service Commissioners and His Majesty's Office of Works a Nature-Study Exhibition was held at Burlington Gardens from October 30 to November 3. In the absence of Lord Avebury, chairman of the committee, Sir Henry Howarth presided, and Sir John Cockburn declared the exhibition open.

It may at once be said that the object of the undertaking was to put into effect, forthwith, the lessons learned from the exhibition held last year at the Royal Botanic Gardens. There, through the energy of Mr. J. C. Medd, for the first time were brought together all the various methods and matters which have been taken or mistaken for nature-study. It soon became obvious that much excellent science teaching on the one hand was masquerading under the title, and on the other that desultory collecting without rhyme or reason was a second claimant for it.

At the suggestion of Mr. Wilfred Mark Webb, honorary secretary of the Middlesex Field Club and Nature-Study Society, delegates from it and from the Selborne Society met to appoint a committee to organise an exhibition on definite lines. The area from which exhibits were invited was also restricted to a dozen or so counties within easy reach of London. Evidence of work was asked for which dealt with such observational teaching as should form part of the education of all. This, while serving as an excellent preparation for science, is scientific only as regards method and accuracy of treatment.

[1] The communications to the various meetings of which mention is made will appear in the *Actes* and the *Comptes rendus* of the Association, most of them *in extenso*. Thanks are due to MM. Pioda, Fischer, Keller and Dufour for information very readily given.

The exhibition has been exceedingly successful from an educational point of view, and the exhibits showed that the schools which contributed had entered into the spirit which guided the committee in the preparation of its prospectus and in the desire to demonstrate what nature-study really is.

The judges were Miss Hodgson, formerly of the House of Education, Ambleside; Mr. Jonas Bradley, famous for his outdoor school at Haworth, Prof. Haddon, Prof. Minchin, and Dr. Chalmers Mitchell. The awards were made in strict accord with the objects of the committee, and were given so as to mark the work of the schools which are on the right lines. Certificates of merit, the highest official award of the committee, fell to the lot of the Froebel Institute, Streatham High School, Dulwich High School, Queenswood School, Orlestone Board School, and the Training College for the Deaf, Fitzroy Square.

Not the least important part of the proceedings were the conferences, at which practical teachers not only described their methods, but also in some cases showed how they came to adopt them. Speakers were carefully chosen from among those who exhibited last year and whose work was well known to the executive committee, of which several members helped to organise the previous effort.

On the morning of Saturday Mr. Hedger Wallace, chairman of the executive, presided over a meeting at which Mr. Badley, of Bedales School, Mr. Harry Lowerison, of the Ruskin School Home, Miss Sillham, of the Froebel Institute, and Miss Ethel Webb, of Streatham High School, spoke. In the afternoon the chair was taken by Mr. Jesse Collings, who had something to say about the Bill which he has before Parliament to promote nature-study in elementary schools, more particularly with the view of improving our agricultural education. There is every hope, moreover, that his measure will be passed without opposition. During the afternoon Miss Alderton, of Stretton, Mr. Thomas, of Orlestone, and Mr. Dodgeon, of Burnley, described their work. In the evening Mr. Richard Kearton, who has done so much to change the taking of birds' eggs for the collection to the taking of them by the camera, showed the pick of his well-known studies of wild-life, and others that had not been seen on a screen before. Afterwards, as on the previous evening, Mr. Martin Duncan proved the great possibilities of the Urban Duncan microbioscope for recording natural history observations in the ordinary way and under the microscope.

On Monday Mr. Oliver G. Pike gave an illustrated lecture on birds in their homes, and later the Middlesex Field Club held a meeting. Mr. Hedger Wallace pointed out the great necessity for a field club which should deal with Middlesex, record the fast disappearing animals and plants, and organise a local museum. Mr. Henry Stevens showed a number of remarkable slides of animals and plants under control, and Mr. Wilfred Webb demonstrated, also by the aid of the lantern (kindly lent by the Royal Geographical Society), how much nature-study could be done in London, proceeding afterwards to touch on the work of schools throughout the country.

On Tuesday evening Mr. R. B. Lodge lectured on some suburban birds and beasts, while under the auspices of the Selborne Society Prof. Boulger and Mr. E. A. Martin spoke on subjects in character with the objects of the exhibition. Financially, also, the exhibition has been a success.

BOTANY AT THE BRITISH ASSOCIATION.

THE meetings of the botanical section at Southport showed no falling off in interest. The arrangements made by the local authorities were admirable, and there was a good attendance of British and foreign botanists.

In his presidential address, Mr. A. C. Seward, F.R.S., gave an able and comprehensive summary of the present state of our knowledge concerning the composition and distribution of the floras of the past, from the earliest records in the Devonian and Lower Carboniferous up to the dawn of the Cretaceous period.

The report of the joint committee of Sections K and L on the teaching of botany in schools was read and discussed. A summary of the recommendations will be found in the report of the education section. In an interesting discussion which followed the reading of the report in Section K, several botanists expressed their approval of the report, and it was suggested that it would be a good plan if the methods recommended could be tried by teachers and the results communicated to the committee.

The morning of September 11 was given up to a series of papers and a discussion on the subject of heredity. Mr. W. Bateson, F.R.S., in an introductory address on recent discoveries in heredity, gave an excellent account of Mendel's researches, and pointed out that we have now reached a stage at which, by the employment of these methods, the solution of problems in heredity becomes possible under certain conditions. He described many of his own experiments, and exhibited specimens of the results which he had obtained in the hybridisation of various species of plants and animals, all of which give strong support to Mendel's laws.

Miss Edith R. Saunders followed by an extremely lucid account of her recent work on cross-breeding in plants, and showed the results of some of her more striking experiments (*vide* Reports to the Royal Society, 1902).

Mr. C. C. Hurst read a paper on recent experiments in the hybridisation of orchids, in which he showed by means of some beautiful coloured drawings that, so far as the intermediate hybrids are concerned, the results are apparently consistent with Mendelian principles. Dominant hybrids are infertile, and in the case of false hybrids further research is necessary before any definite conclusions can be arrived at.

The morning of September 14 was devoted to a discussion on the origin of the Monocotyledons, introduced by Miss Ethel Sargant, whose work on this subject is well known (*vide* "Annals of Botany," 1903). Miss Sargant maintains that a careful study of the anatomy of seedlings in various families of Monocotyledons and Dicotyledons leads to the conclusion that the common stock from which they both spring was not only angiospermous in character, but that it was more like a Monocotyledon than a Dicotyledon.

Miss E. N. Thomas, who followed with a paper on the structure of the embryo sac and the phenomena of fertilisation, pointed out that the results obtained support Miss Sargant's view in so far as they indicate the existence of a great gulf between Angiosperms and all other groups of plants, whilst there is little, if any, distinction in these respects between Dicotyledons and Monocotyledons.

In the subsequent discussion Miss Sargant's views were freely criticised, but all the speakers agreed that this valuable contribution to a very difficult question opened up a very interesting field of investigation.

Prof. H. Marshall Ward, F.R.S., gave an account, illustrated by plans and lantern slides, of the new botanical laboratories at Cambridge. This large block of buildings provides ample accommodation for study in all departments of botany, and special facilities are afforded for original investigation. The university is to be congratulated upon so important a development of its botanical school. Prof. Lignier presented a paper on the flower of the Gnetaceæ, in which some interesting new facts were brought forward, and Dr. Lotsy gave an account of his work on parthenogenesis in *Gnetum ula*.

The semi-popular lecture was given on the afternoon of September 14 by Prof. J. B. Farmer, F.R.S., on stimulus and mechanism in organisation. In a very able address the lecturer discussed the various forms of stimuli and the nature of the processes involved, and endeavoured to trace a connection between the growth and structural differentiation of an organism and the response to definite stimuli acting on special kinds of mechanism.

On September 12 an excursion, under the leadership of Mr. Lomax, was made to the Clough Foot Colliery, and on Tuesday afternoon the vegetation of the sandhills was investigated under the leadership of Dr. Otto v. Darbishire and Mr. Henry Ball. In a paper which he had previously communicated to the section as a preliminary to this excursion, Dr. Darbishire pointed out that the sand dunes are encroaching on the grass land, and that, although they can be fixed by sand-loving plants, it is only temporarily, and psamma is commonly planted for this purpose. The plant societies in the various regions of the dunes are well marked, and include a number of extremely interesting